
Space Weather Forecast

Issued on Saturday, 25 November 2023 at 01:15 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales <https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales>

Space Weather Forecast Headline: Isolated R1-R2 Radio Blackouts likely throughout. Chance of Minor Geomagnetic Storms days 1-2 (25-26 Nov).

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Moderate with a single low-level Moderate flare from a sunspot near the northern central disc at 24/0937 UTC. There are currently twelve sunspot groups on the visible disc, the majority of which are located in the eastern solar hemisphere. The largest group is a magnetically complex region in the southeast, but there also is a large cluster of various sunspot groups in the northeast, approaching centre that appear to be magnetically connected.

A Coronal Mass Ejection (CME) associated with the Moderate flare from the sunspot near central disc has been analysed and modelled as a likely miss below Earth orbit, with just a slight chance of a glancing blow on 27 Nov. A second CME from a long duration event Common-class flare late in the UTC day on 24 Nov appears to have resulted in a CME. More solar imagery is awaited to help determine if an Earth-directed CME has resulted from this.

Solar Wind / Geomagnetic Activity: Solar wind parameters have been largely indicative of a background solar wind regime following the easing of the connection to a coronal hole high-speed stream. Wind speeds fell from 380km/s to a minimum of 340km/s around 24/1900 UTC. Since then an enhancement has taken place and speeds have risen, with a discontinuity close to 24/2300 UTC, increasing speeds to between 450-470km/s. This is indicative of a CME arrival at Earth, speculated to be from the arrival of the 22 Nov CME originating from a region in the SE disc. The Interplanetary Magnetic Field was at Weak levels for much of the period, but increased to Weak to Moderate levels later in the UTC day, then more persistently Moderate with the CME arrival. The important north-south component has varied weakly at first, but since the CME arrival has varied between weakly positive and moderately negative. Resultant geomagnetic activity was initially Quiet (Kp 1-2), but increased to Unsettled (Kp3) from 24/1800-2400 UTC.

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Moderate with further isolated Moderate class flares likely and a slight chance of isolated Strong flares, mainly from current eastern solar hemisphere sunspot regions. Despite this the recent moderate flare was from a relatively magnetically simple area near the southern centre disc.

Solar Winds / Geomagnetic Activity: Two CMEs are expected to affect Earth in the forecast period, with the first having arrived late on 24 Nov and the second arriving late day 1 (25 Nov) or early day 2 (26 Nov). A further CME resulting from the Moderate flare from the sunspot near southern centre disc on 24 Nov has been analysed and modelled as a likely miss below Earth orbit, with just a slight chance of a glancing blow on day 3 (27 Nov).

Solar winds are currently at Slightly Elevated levels, between 450-470km/s following the recent arrival of a CME at Earth. Speeds may erratically fall towards Background again later on day 1

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(25 Nov) ahead of a further CME, either late day 1 (25 Nov) or early day 2 (26 Nov) giving more persistently Slightly Elevated speeds again. The next significant coronal hole enhancement is expected on day 2 (26 Nov) giving speeds of up to 500-550 km/s (Elevated) that should broadly persist to the end of the forecast period.

Geomagnetic activity is Unsettled at the time of writing, but likely to soon increase to peak at Active to G1/Minor storm levels early on day 1 (25 Nov) before reducing to mainly Unsettled levels ahead of the next CME arrival late day 1 (25 Nov) or early day 2 (26 Nov) when further Active to G1/Minor Storm conditions are probable. Combined CME and HSS influences may extend slightly enhanced Geomagnetic activity at Quiet to Unsettled levels into day 3 (27 Nov), but should subside to become mainly Quiet by day 4 (28 Nov).

Energetic Particles / Solar Radiation: No solar radiation storms are expected. However, there is a slightly higher risk of observing S1/Minor Storm conditions compared to normal, given the number of sunspots currently on the disc and their propensity to move into a more favourable location on the disc for connection with Earth in the coming days.

Geomagnetic Storms:

Geo-Magnetic Storm	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Minor or Moderate	G1 to G2	No	50	50	10	5
Strong	G3	No	5	5	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	Yes	70	70	70	70
Very Active	R3 to R5 X	No	10	10	10	10

Solar Radiation Storms - (High Energy Protons):

Radiation Storms	Level (cm ⁻² sr ⁻¹ s ⁻¹)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	10	10	15	15
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = cm⁻²sr⁻¹s⁻¹)